REMARKS

The Office Action dated September 3, 2008, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

STATUS OF THE CLAIMS

Claims 16-29 are currently pending in the application, of which claims 16, 21, and 25 are independent claims. Claims 19, 21, and 25 have been amended to more particularly point out and distinctly claim the subject matter of the present invention. No new matter has been added. Claims 16-29 are respectfully submitted for consideration.

SPECIFICATION OBJECTION

The specification was objected to for failing to include section headings, as required in 37 CFR 1.77(b). The specification has been amended to include appropriate section headings. Accordingly, Applicant submits that this objection is rendered moot.

CLAIMS REJECTION UNDER 35 U.S.C. 102

Claims 16-29 were rejected under 35 U.S.C. 102(b) as being anticipated by "Reverse Engineering Trimmed NURB Surfaces from Lased Scanned Data," The Solid Freeform Fabrication Conference, Online, December 31, 1998, XP002274134 of Steinberg et al. ("Steinberg"). Applicant respectfully traverses this rejection.

Independent claim 16, upon which claims 17-20 depend, is directed to a method of creating a three-dimensional model of a tangible existing object. The method includes digitizing the object to create a polygon mesh of the object. The method also includes breaking the polygon mesh into separate bilinear NURBS patches. The method further includes uniting the bilinear NURBS patches to form a continuous surface composite of the bilinear NURBS patches to obtain a surface model or solid model of the object.

Independent claim 21, upon which claims 22-24 depend, is directed to an apparatus for creating a three-dimensional model of a tangible existing object. The apparatus includes a digitizer for creating a polygon mesh of the object. The apparatus also includes a data processor for executing the data processing steps of reading the polygon mesh, breaking the polygon mesh into separate bilinear NURBS patches, and uniting the bilinear NURBS patches to form a continuous surface composite of the bilinear NURBS patches to obtain a surface model or solid model of the object.

Independent claim 25, upon which claims 26-29 depend, is directed to a computer program embodied on a computer-readable medium. The computer program is for creating a three-dimensional model of a tangible existing object. The computer program executes data processing steps by software routines when it runs on a computer. The data processing steps include reading a polygon mesh of the object. The data processing steps also include breaking the polygon mesh into separate bilinear NURBS patches. The data processing steps further include uniting the NURBS patches to form a continuous surface

composite of the bilinear NURBS patches to obtain a surface model or solid model of the object.

Applicant respectfully submits that Steinberg fails to disclose or suggest all of the features of any of the presently pending claims.

Steinberg generally relates to a mesh with little or not interaction from an user. The user can produce degree 2 and higher BSpline surfaces and can choose the degree and number of segments as parameters to the system. The BSpline surface is both compact and curvature continuous. The former property reduces the large storage overhead, and the later implies a smooth curve can be created from noisy data (*see* Steinberg at Abstract).

Applicant respectfully submits that Steinberg does not disclose or suggest "breaking the polygon mesh into separate bilinear NURBS patches," as recited in independent claim 16 and similarly recited in independent claims 21 and 25.

The Office Action took the position that these features are disclosed by Steinberg at the paragraph entitled "Scanning and Processing." In the cited portion, Steinberg states, "Since the boundary of the surface is rectangular i.e. we fit a surface that is larger than the data." Steinberg also states, "Objects which have a large number of convolutions generally need to have large amount of segments in both the u and v directions" (*see* Steinberg at the paragraph entitled "User Input," lines 2-3). In other words, Steinberg refers to **approximating** a polygon mesh in order to recreate the shape

of an original object. However, Steinberg fails to disclose or suggest **breaking** the polygon mesh into separate bilinear NURBS patches.

The Office Action also took the position that the features of the claimed invention are disclosed by Steinberg at the paragraph entitled "Brief description of the Least Squares Method (LSM)." In the cited portion, Steinberg refers to using the LSM for finding a NURBS surface that has a minimum distance to the data points. Thus, the LSM is an approximation method in which a certain number of faces of the polygon mesh is **replaced** by a kind of average surface. However, Steinberg does not teach or suggest that the polygon mesh is **broken** into separate bilinear NURBS patches.

The Office Action further took the position that the features of the claimed invention are disclosed by Steinberg at the paragraph entitled "Parameterization." In the cited portion, Steinberg refers to selecting a specific (*e.g.,* a cylindrical) scheme to map the polygon mesh. Such a scheme involves specific assumptions regarding the object (*see, e.g.,* Steinberg at the paragraph entitled "Parameterization," lines 5-6), and therefore, the selected scheme is an **approximation** of the polygon mesh. Thus, Steinberg fails to teach or suggest a **breaking down** of the polygon mesh into separate bilinear NURBS patches.

The Office Action additionally took the position that the features of the claimed invention are disclosed by Steinberg at the paragraph entitled "Smoothing Functions." In the cited portion, Steinberg states, "However, one of the problems with the least squares method is that holes or missing data can potentially cause the matrix to become singular."

In other words, Steinberg admits that its method leads to flaws and are, therefore, an **approximation** of the polygon mesh, not a **breaking down** of the polygon mesh into separate bilinear NURBS patches.

Further, Steinberg does not disclose or suggest breaking the polygon mesh into separate **bilinear NURBS patches**. Thus, due to the approximations, the method of Steinberg results in a non-faceted NURBS model which has large deviations from the raw data points or the polygon mesh obtained after digitizing the object.

In contrast, the claimed invention employs bilinear NURBS patches. This leads to a NURBS-model having a faceted appearance, with little or no deviation from the original data points or the polygon mesh obtained after digitizing the object. For example, the claimed invention creates NURBS-models of complex organic objects, such as the one in Figure 12a, with no flaws, unlike models created by reverse engineering, such as the one in Figure 12b, and those in Steinberg (*see also* Specification at page 17, line 3 to page 18, line 26).

Therefore, Steinberg fails to disclose or suggest "breaking the polygon mesh into separate bilinear NURBS patches," as recited in independent claim 16 and similarly recited in independent claims 21 and 25.

For at least the reasons discussed above, Applicant respectfully submits that Steinberg does not disclose or suggest all of the elements of independent claims 16, 21, and 25. Accordingly, Applicant respectfully requests that the rejection of independent claims 16, 21, and 25 be withdrawn.

Claims 17-20, 22-24, and 26-29 depend respectively from, and further limit, claims 16, 21, and 25. Thus, each of claims 17-20, 22-24, and 26-29 recite subject matter that is neither disclosed nor suggested in Steinberg. It is, therefore, respectfully requested that the rejections of claims 17-20, 22-24, and 26-29 be withdrawn.

CONCLUSION

For the reasons explained above, it is respectfully submitted that each of claims 16-29 recite subject matter that is neither disclosed nor suggested in the cited art. It is, therefore, respectfully requested that all of claims 16-29 be allowed, and that this application be passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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